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2010 Draft 303(d) List of Impaired Waters; Consolidated Assessment and Listing Methodology

Janet Pittman

Rules Development Branch

Office of Legal Counsel, MC 65-46

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DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
OFFICE OF LAND QUALITY

Dear Ms. Pittman:

This is my commentary on the water quality in Indiana, specifically Salamonie Lake. Indiana is one of the worst states in the nation on water quality. IDEM should be ashamed!

Salamonie Lake is situated in northeastern Indiana in Wabash and Huntington counties. Salamonie is, at summer pool, a 2,665 acre lake, with a drainage area of approximately 533 square miles. It was created in 1966 by the U. S. Army Corps of Engineers (the "Corps") when the Corps dammed the Salamonie River. The reservoir operates primarily as a unit with Roush (Huntington) and Mississinewa Lakes to reduce flood stages in the Upper Wabash River Basin. Today the lake also provides recreational opportunities such as swimming, fishing, boating, and camping. The Salamonie Lake property also has sixty ponds, marshes and wetlands on it. Salamonie Lake is a valuable asset to the state of Indiana and the communities near the lake. This is per public information at the U. S. Army Corps. of Engineers:

The FY 07 visitation at Salamonie was 443,796.

The Corps figure for estimated visitor expenditures was \$11,476,562.00

Salamonie Lake is having a rough time keeping from being polluted from the excess E.Coli, nitrogen, algae and phosphorus that leak into the lake from excess farm runoff and the Concentrated Animal Feeding Operations (CAFOs) that are in place in the surrounding areas. We need to protect the jewels that we have in our reservoirs from more pollution from all sources!

Also, the Teays Aquafier runs all through the Salamonie Lake area within a mile or so. It is the source of drinking water for thousands of people. If Salamonie is badly polluted, the pollution will also get into hundreds of wells in the area

Since 2005 we have been the Volunteer Lake Monitors for Salamonie Lake in the Volunteer Lake Monitoring Program with IDEM (Indiana Department of Environmental Management)/ Indiana University. The best reading for clarity of the lake that we've ever had is 3'1". Before the CAFO dairies, you could often see 5' or deeper. Algae appear to be increasing in the lake. Salamonie is managed for not only recreation and flood control, but it is also managed for water quality. One of the ways to assess the health of a lake is to determine how much and what kind of algae live in the lake. Algae samples were collected from Salamonie Lake between July 1999 and September 2007 as part of the U. S. Army Corps of Engineer's lake monitoring program.

The below is from "The Science of Algae and What it Can Tell Us-Salamonie Lake", a publication of the US Army Corps of Engineers, Louisville District Water Quality Team Environmental Branch, 2008.):

Many studies of lakes are based on how productive a lake is, or how much life it can support. A certain amount of production is essential for fish consumption, but excessive productivity results in problems. Lake productivity is described in terms called trophic levels. The 4 primary trophic states are:

Oligotrophic-least productive, very little life

Mesotrophic – balanced production, stable food chain, considered the healthiest condition.

Eutrophic-very productive which can result in too much algae

Hypereutrophic-most productive of conditions, translating into far too much algae.

Lakes naturally increase in trophic status as they age, but sometimes humans speed up the process unnaturally by contributing nutrients and other pollutants to the ecosystem. When production in a lake exceeds the lake's capacity to decompose organisms, problems soon follow. Humans often indirectly affect how much light and nutrients are available to algae. The disturbance of soil through agricultural activity or nearby construction, for example, can cause sediment to enter the lake. Commonly referred to as erosion, this will result in increased turbidity of the water, which, in turn, results in less light penetration and cloudy water. Reduced light penetration results in limited phytoplankton production, less food at the foundation of the food chain, and lower productivity.

The introduction of nutrients to the lake as a result of crop management or the direct discharge of human or animal waste to the lake will elevate the level of nutrients in the water resulting in accelerated production of phytoplankton. The resultant increase in phytoplankton, often referred to as an algal bloom, can cause a whole host of issues, not the least of which is a deadly affect on the fish population. All algae produce oxygen through photosynthesis during the day and increase the amount of dissolved oxygen in water. Photosynthesis stops in the absence of sunlight, and, coupled with the oxygen consumption during bacterial decomposition of the dead algae, oxygen levels decrease at night. This produces a normal fluctuation in dissolved oxygen that fish and other animals have adapted to. But following a large algal bloom, a disruption in the food web balance takes place. Significantly more dissolved oxygen is used during the bacterial decomposition of the massive algal bloom during the subsequent die-off. This increase in oxygen use is masked during the day, but at night when photosynthesis stops, dissolved oxygen levels drop significantly. These drops can often be lethal for fish.

Phytoplankton samples collected between 1999 and 2007 from Salamonie Lake were identified by aquatic biologists. Findings were quantified based on algae cell counts and biovolume (a measurement of cellular biomass or abundance). Once the abundance of individual groups of phytoplankton was calculated, the results, in combination with nutrient and other data, were used to determine Salamonie's productivity, or trophic status, as indicative of lake health. Additionally, biologists charted spikes in phytoplankton growth to identify potential correlations between accelerated growth periods and possible pollution sources.

The results showed that the Phytoplankton community in Salamonie during the sampling period was relatively diverse early in the year but dominated by undesirable blue-green algae in the late summer. One notable trend was that there was a decreasing trend in the percentage of blue-green algae over the sampling period. Overall abundance of algae, described as algal density, was elevated compared to other Corps maintained lakes in the same region though found to be decreasing slightly over the course of the sampling period.

Based upon the assumption that lake health can be directly correlated to phytoplankton dynamics and nutrient data, Salamonie Lake is a very productive lake. In scientific terms, the trophic status or productivity of Salamonie would be generally characterized as eutrophic.

See the below article for more information on the blue-green algae:

Unsafe waters in Indianapolis

NUVO (Indianapolis Weekly)

By Laura McPhee, Aug. 5, 2009

<http://www.nuvo.net/news/article/unsafe-waters-indianapolis>

A fast and toxic algae growth spurt on Central Indiana waterways this summer was responsible for hundreds of dead fish in White River in Indianapolis, as well as warnings to those using the Geist or Morse reservoirs for summer recreation.

In mid-July, a large number of resident complaints about floating clumps of algae on White River in Hamilton County and south into Marion County prompted the Indiana Department of Environmental Management to test toxicity levels. At the time, IDEM spokesperson Amber Finkelstein reported nothing unusual or dangerous about the increased algae, saying it was harmless and rare, caused by "temperature, rain and run-off from yards."

Two weeks later, however, those algae blooms are being blamed on increased levels of oxins in the river and the dead fish.

On July 24, after receiving numerous and continuing complaints about a fish kill around Rocky Ripple, IDEM and the Department of Natural Resources sent investigators to determine the problem. Five days later, a simple press release announced that the fish kill was the "result of an excessive algae bloom."

But it's not quite that simple. While there are dozens of types of algae that occur naturally in waterways, and the majority of them are not toxic, there are an increasing number of

blue-green algae that science is finding to be more pervasive and toxic than thought.

Blue-green algae have many names; technically it's cyanobacteria ("cyan" for the blue; "bacteria" because it actually is bacteria that produces toxins). The bacteria grow in warm, moist and fertilizer-rich environments. Heavy infestations of this type of algae, known as blooms, are stimulated by excessive levels of phosphorus and nitrates in the water, according to IDEM. Run-off from lawn and field fertilizers is cited as the most common cause for increases, particularly in the summer.

The type of blue-green algae of most concern has only been found in Indiana since 2001, and wasn't known to exist anywhere in the United States prior to the 1990s. Since 2007's unprecedented occurrence of algae problems at Geist, the IUPUI Center for Earth and Environmental Science has been monitoring Indiana waterways and tracking the levels of toxins created and released by the algae.

"When the algae are in very high concentrations, like they are right now in the White River, they make oxygen during the day, but rob oxygen from the water at night," according to Lenore Tedesco, director of CEE. "Without enough oxygen, fish will basically suffocate."

While the presence of this type of algae is natural, the excessive and fast growth as seen in recent weeks, and the resulting dead fish, are not produced by natural causes.

"Right now we are seeing algal blooms in many of our freshwater systems," Tedesco said. "This suggests excessive nutrients in the water."

By nutrients, Tedesco means nitrogen and phosphorus -- elements most associated with the run-off and dumping of fertilizers containing phosphorus and animal waste, as well as nitrogen found in the raw sewage of human waste.

In addition to testing White River, Tedesco and her team of researchers are also responsible for testing the waters at Geist and Morse Reservoirs for these types of algae, as part of a multiyear project that documents the extent of the toxic algae problem in Indiana.

While there are no national standards for what constitutes dangerous or unacceptable levels of the toxins associated with this type of algae, the World Health Organization has designated risk categories associated with the parts per billion of toxin to water. Low risk is categorized as 2-4 ppb.

As of last Friday, Geist had 6 ppb of microcystin in the water -- the type of toxin known to cause a variety of adverse health effects, including liver toxicity and neurotoxicity, as well as promoting tumorgrowth. Exposure to the algae, even in low levels, can cause rashes, skin and eye irritation, allergic reactions and gastrointestinal upset. At high levels, exposure can result in serious illness or death.

Over the past few years, public health officials throughout the Midwest have reported excessive growth of toxin-producing blue-green algae in Illinois, Indiana, Iowa, Michigan,

Nebraska and Kansas, according to IDEM.

Health alerts in each state, as well as reports of livestock and pets dying after drinking or coming into contact with the contaminated water, and human illness have been reported. Here in Indiana, more than 25 lakes, reservoirs and streams have been found to contain microcystin, the toxin most worrisome from the blue-green algae.

Eagle Creek, Geist and Morse reservoirs are under the most scrutiny, as they provide drinking water and summer recreation opportunities. While water treatment facilities claim to be able to safely manage the removal of the toxins before it is consumed through their delivery methods to residents' homes, swimming and other sports provide an increased risk that cannot be managed at this point.

On July 29, IDEM released a warning about high levels of blue-green algae at Morse and Geist.

"Direct contact with blue-green algae can cause skin irritation," IDEM warns. "Drinking untreated water, intentional or accidental, may result in gastrointestinal illness and more severe illness may occur with the presence of microcystin toxin."

According to IDEM, anyone who comes in contact with the water in these sources should take a bath or shower with warm soapy water immediately afterward -- particularly before preparing or consuming food. Do not use untreated water from ponds, lakes, streams or reservoirs to drink, cook or shower.

"It is important for individuals to avoid coming into direct contact with the algae and to try to avoid swallowing water if at all possible," said James Hall, state epidemiologist.

Below is a synopsis of what happened this past July (2009) in Salamonie Lake.

This happened twice in 4 days time and 3 times total in 2 weeks time.

7/4/09 . I (Leslie) was swimming at the Dora Boat Ramp on Salamonie about 8:15 AM this morning, and the algae was terrible at there. Today the water was a deep green at and near the Dora Ramp because the algae was so thick - fine particles everywhere, much larger particles floating around, and a lot of foamy green-white clumps at 8:15 to 8:45. This was not only in the shallows, but in much deeper water - even 100' out from shore.

7/8/09 Leslie Patterson and Bonnie Hahn (phone#260-786-0231), Andrews, were going over the St. Hwy. 105 bridge south of Andrews and south of the Andrews Dairy this morning a little after 8:30 AM. There were huge scums of deep green algae (like what was at Dora Ramp July 4) all over - on both sides of the bridge. I (Leslie) took several dated, digital camera pictures. The algae seemed to be flowing from the northeast, which is where the creek on 250S is, near Andrews Dairy (formerly DeGroot). This is the creek with the extremely high E.Coli counts in June. We drove to the beach at Lost Bridge West because it seemed to be heading that way. It was very bad there, at the east end of the beach, where I took a water sample in a clean bottle that I

had just unwrapped. I took this water sample to the US Army Corps. of Engineers' office. They refrigerated it, about 45 minutes after I got it. I smelled it, and it smelled terrible like manure to Bonnie and I. We could also smell manure in the air at the bridge and where we took the sample. Bonnie Hahn called IDEM. They said they didn't know if the IDEM officials for the spill line would come up for algae. The DNR is calling this a natural summer algae bloom, but we don't think it is. It is coming from the direction of that creek with high E. Coli counts, the same creek that DeGroot Dairy (now Andrews Dairy-Vreba-Hoff is the parent company) polluted in the past. In addition, I have seen natural algae blooms at Salamonie several times in the past (years ago) before the CAFO dairies were in existence.

They were different than these, plus they did not have the awful manure-like smell that these have. I think this has something to do with one of the dairies in Huntington County dumping manure in a stream leading into Salamonie again, especially with the very high E. Coli counts on the stream near where the Andrews Dairy is.

I called the DNR and reported this algae problem. A Conservation Officer returned my call, and said he was heading to the Dora Ramp, but that it would be awhile before he could arrive there. The wind has kicked up some now, and there is a possibility the algae could all be dissipated by the time he gets there. I also called the IDEM spill line and requested that they come up. They said they would probably call the DNR and see what they determined before coming.

7/20/09 Once again there was a bunch of deep green algae and white foam/flecks under the Hwy. 105 bridge, just not as bad as on July 8th. I called the EPA, and the Corps again.

www.usawaterequality.org/volunteer/Ecoli/vaintrobact.pdf shows the E.coli surface water standard for primary recreational use. It said the geometric mean is 126 and the single sample maximum 235.

The June 2009 readings that the Corps did were a lot more than that almost everywhere they tested. The majority of them were a lot higher than this, and 2 of them were 110,000 and 69,000. These 2 readings were taken on creeks near the Andrews Dairy (formerly DeGroot), who had numerous violations for manure getting into a ditch that led directly into Salamonie. Vreba-Hoff is the parent company. I am concerned that they are once again polluting Salamonie.

In August 2009 the U.S. Army Corps of Engineers took 100 readings from all the creeks and ditches that led into Salamonie. E. coli levels tested less than the 200 units/100 ml standard within the reservoir and tributary mouth sites.

I strongly feel that the reason things improved at Salamonie during August and September, and the readings in August were so much better than the readings that the Corps took in June is because the Corps and the EPA were involved after what happened in July, and the CAFOs knew this. They also may have gotten word ahead of time as to when testing was going to be done again in August. How this happened I do not know.

In August of 2004 and other times in 2004, we saw this same foul-smelling, disgusting-looking algae with thick white scum on top, both from our boat and our vehicle. We called IDEM's Spill-response hotline. An official there on 8/15/04 told us that IDEM was aware of this problem, and that what we

were seeing is > "> a natural algae bloom> "> . There seemed to be a lack of urgency about investigating this situation. Timeliness of investigation is a critical matter, to trace a spill back to it's source. > We have seen the > "> natural algae blooms> "> , and there is no way this was one of those.

There has never been a time since then that Salamonie Lake has been free of algae, sometimes worse than other times, such as July of this year, when it was as bad as 2004. These testings need to be done continually on a regular basis.

The Salamonie River used to be clear about 10 years ago. I, Leslie, used to tube it. Now, even though Salamonie Lake is better than it was in July, it still has a lot of algae in it that it never used to have, and the Salamonie River was always either brown or green this summer, never clear. I feel that it was filled with nitrogen and algae (and maybe E-coli) from manure at that time. I questioned whether fish from it should even be eaten then. Now, since the Corps has started lowering the reservoir, the quality seems much improved. The river looks as it should have looked in the spring and summer.



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